Sheldon School
Chippenham

Algebra Transition Booklet

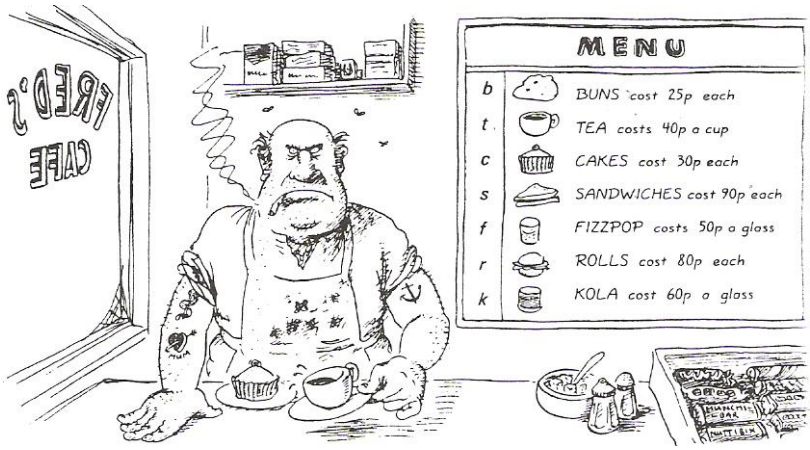
Chippenham
Partnership of Schools

Year 6 Mathematics

Answer Booklet

Fred's Cafe

Welcome to Fred's Café. When Fred is taking an order he uses a short-hand code. You can see Fred's code written on the menu below.



Write these orders in Fred's code. The first one is done for you.

1) The cost of a cup of tea and a sandwich: *t + s*

2) The cost of a cup of tea and a cake: **t + c**

3) The cost of a glass of kola and a bun: **k + b**

4) The cost of a bun, a cup of tea and a sandwich: **b + t + s**

5) The cost of a cup of tea and a glass of kola: **t + k**

Here are six more orders. Write them using Fred's code. The first one is done for you.

1) 2 teas: *2t*
2) 3 cakes: **3c**
3) 2 kolas: **2k**
4) 4 teas: **4t**
5) 3 sandwiches: **3s**
6) 2 teas & a bun: **2t + b**

Use Fred's menu to work out the amount of each bill. The first one is done for you.

1) t + c = 40 + 30 = 70 pence

2) b + c = **25 + 30 = 55 pence**

3) t + k = **40 + 60 = £1**

4) b + t = **25 + 40 = 65 pence**

5) f + c = **50 + 30 = 80 pence**

6) s + f = **90 + 50 = £1.40**

7) t + s = **40 + 90 = £1.30**

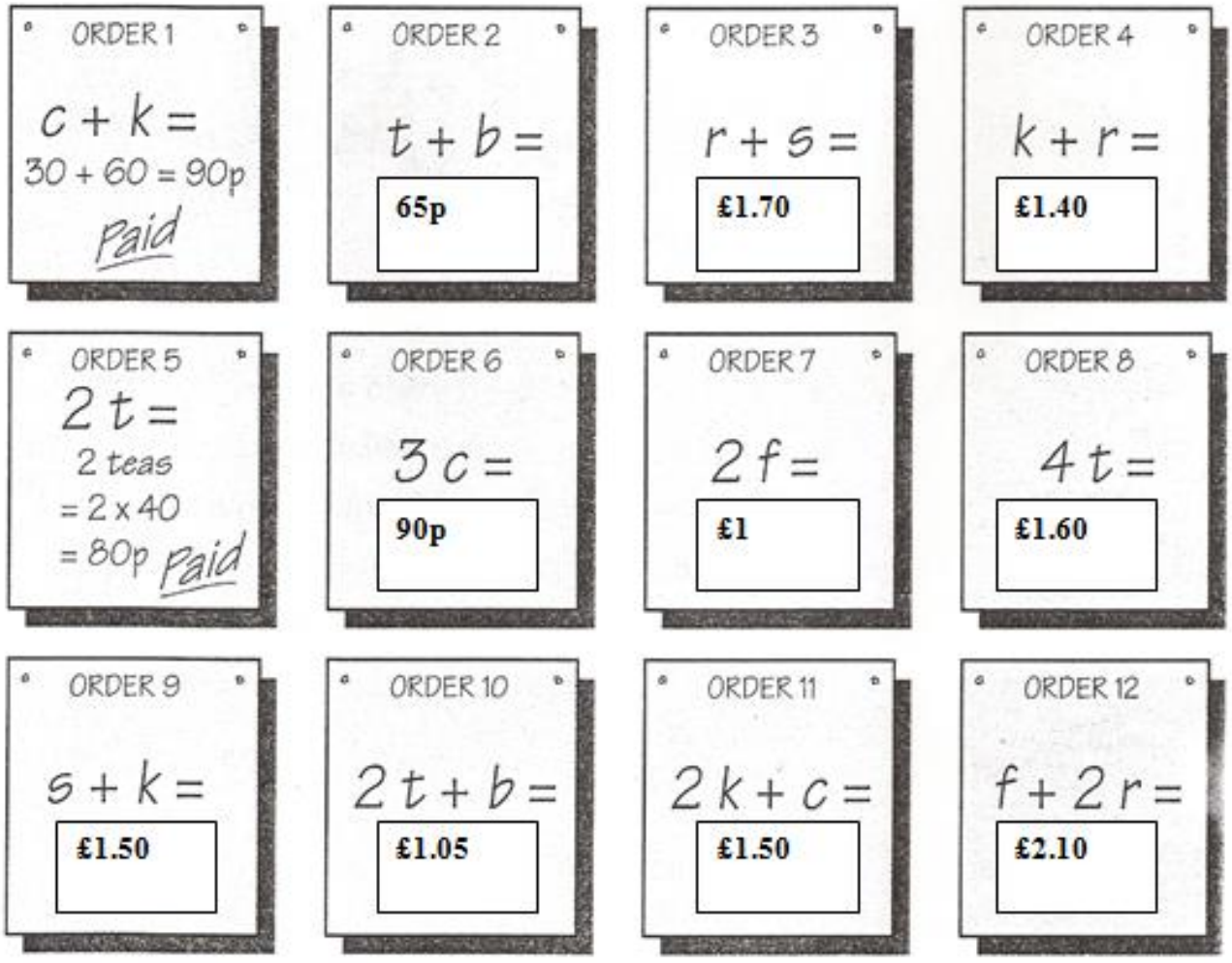
8) f + b + s = **50+25+90 = £1.65**

9) c + s + t = **30+90+40 = £1.60**

10)s + s + t + k = **90 + 90 + 40 + 60 = £2.80**

Extension:

Use the menu to work out Fred's bill:



Puzzling Algebra

Algebra can also be used to solve puzzles. The letters or pictures in each row or column add up to the numbers shown. Try to find the values of all the characters and then find the value represented by the question mark for each question.

s = 4, t = 2, u = 5, v = 3
s + v + t + u = 14

1).

s	v	t	u	?
s	s	s	s	16
t	v	t	u	12
v	v	s	u	
13			19	

a = 5, b = 2, c = 3, d = 7
a + b + d + c = 17

2).

a	b	d	c	?
d	b	d	c	
a	d	d	a	24
c	a	d	d	
20	16	28		

3).

w	z	y	x	
y	x	y	z	22
w	z	w	w	
x	x	x	x	24
16	28	?		

w = 3, x = 6,
y = 4, z = 8.
y + y + w + x
= 17

4).

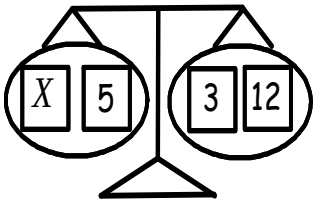
e	e	f	f	28
f	h	g	g	
f	f	f	f	20
h	h	g	e	
?	22	16		

e = 9, f = 5,
g = 3, h = 4
e + f + f +
h = 23

Balancing the Scales 1

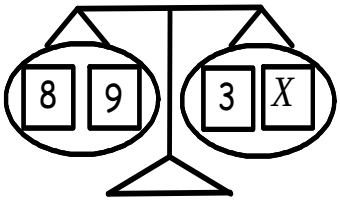
Work out the value of the weight x on each of the scales below:

a)



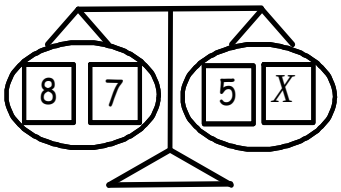
x = …**10**…..

b)



x = …**14**…..

c)



x = …**10**…..

Introduction: In the same way solve these equations (find a value for x).

1) $x + 9 = 6 + 5$ x = …**2**…

2) $9 + x = 13 + 8$ x = …**12**…

3) $x + 7 = 20 + 1$ x = …**14**…

4) $15 + 15 = x + 6$ x = …**24**…

Now try these equations involving subtraction:

1) $x - 4 = 6 + 6$ x = …**16**…

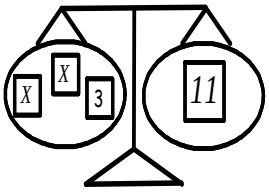
2) $9 + x = 13 - 3$ x = …**1**…

3) $x - 7 = 20 + 7$ x = …**34**…

4) $16 - x = 5 + 6$ x = …**5**…

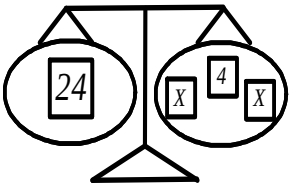
Consolidation: The scales below show some two step equations.

a)



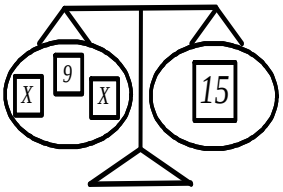
x = …**4**…

b)



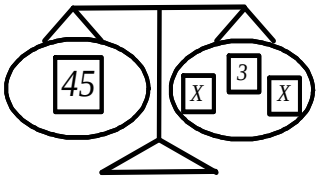
x = …**10**…

c)



x = …**3**…

d)



x = …**21**…

Solve the following equations in the same way.

1) $2x + 1 = 9$ x = …**4**…

2) $2x + 11 = 21$ x = …**5**…

3) $20 = 2x + 14$ x = …**3**…

4) $7 = 2x + 4$ x = …**1.5**…

Extension: Try these equations involving subtraction:

1) $2x - 5 = 3$ x = …**4**…

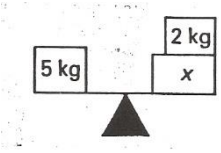
2) $2x - 1 = 17$ x = …**9**…

3) $16 = 2x - 4$ x = …**10**…

4) $11 = 2x - 8$ x = ...**9.5**…

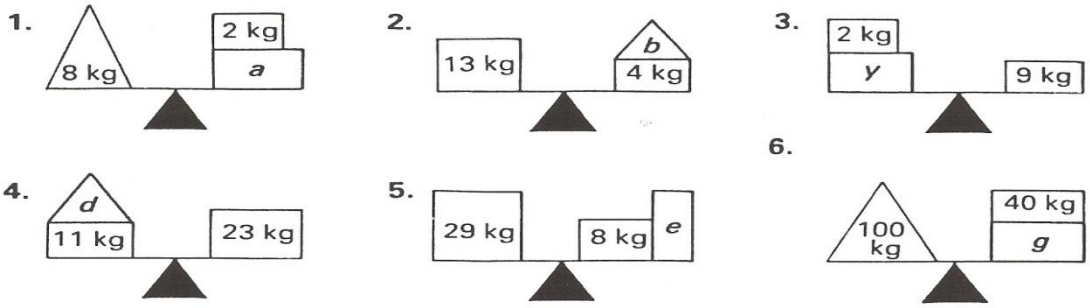
Balancing the Scales 2

Example: The scale is balanced, so x must be 3kg.

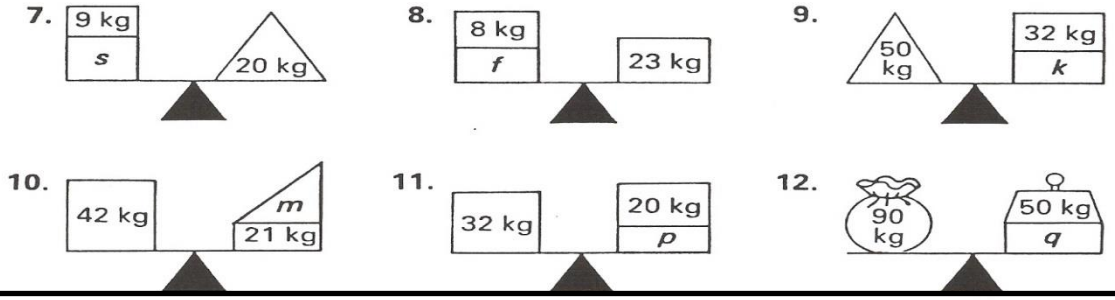


Try to work out the weight of the letter in each question, write your answers at the bottom of the page in the space provided.

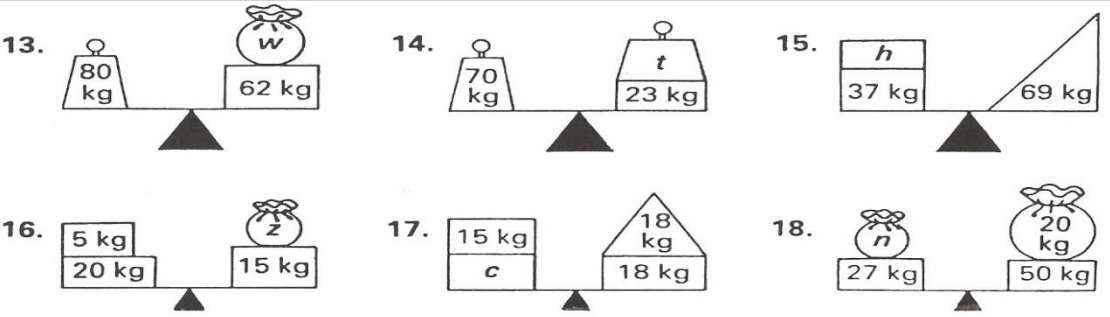
Introduction



Consolidation



Extension



Introduction

1) a = ...6...
2) b = ...9...
3) y = ...7...
4) d = ...12...
5) e = ...21...
6) g = ...60...

Consolidation

7) s = ...11...
8) f = ...15...
9) k = ...18...
10) m = ...21...
11) p = ...12...
12) q = ...40...

Extension

13) w = ...18...
14) t = ...47...
15) h = ...32...
16) z = ...10...
17) c = ...21...
18) n = ...43...

Solving Equations

Can you find out what the letters stand for?

Introduction:

1) a + 3 = 7	a = …**4**…	5) f + 2 = 17	f = …**15**…
2) 6 + c = 14	c = …**8**…	6) 15 = h + 3	h = …**12**…
3) 24 – e = 13	e = …**11**…	7) 23 – u = 17	u = …**6**…
4) 10 = 5 x k	k = …**2**…	8) 9 x j = 54	j = …**6**…

Consolidation:

1) 14 ÷ p = 2	p = …**7**…	5) 8 = 16 ÷ w	w = …**2**…
2) y + 6 = 14	y = …**8**…	6) 18 – g = 13	g = …**5**…
3) 11 = t + 9	t = …**2**…	7) 3 x m = 18	m = …**6**…
4) 5 x n = 35	n = …**7**…	8) 40 – f = 25	f = …**15**…

Extension:

1) 3f + 6 = 18	f = …**4**…	5) 4q + 4 = 16	q = …**3**…
2) 5g + 2 = 32	g = …**6**…	6) 2y + 6 = 24	y = …**9**…
3) 2w + 7 = 17	w = …**5**…	7) 5g + 9 = 14	g = …**1**…
4) 7k + 8 = 22	k = …**2**…	8) 10d + 11 = 91	d = …**8**…

Well done! You've just solved your first algebraic equations!

Substitution

In each of questions below substitute the numbers into the expressions in the box.

Introduction:

A + 3	1a) A = 3	6	b) A = 99	102	c) A = 37	40	d) A = -4	-1
B - 4	2a) B = 6	2	b) B = 9	5	c) B = 20	16	d) B = 2	-2
15 – C	3a) C = 4	11	b) C = 9	6	c) C = 12	3	d) C = 20	-5

Consolidation:

D + 14	1a) D = 7	21	b) D = 9	23	c) D = 12	26	d) D = 25	39
3E	2a) E = 2	6	b) E = 6	18	c) E = 10	30	d) E = 12	36
8F	3a) F = 3	24	b) F = 5	40	c) F = 10	80	d) F = 9	72

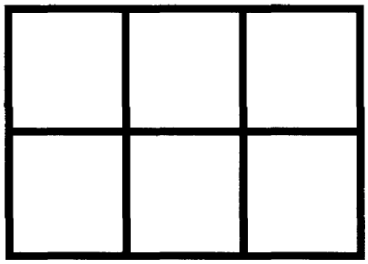
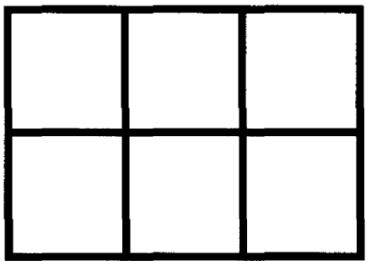
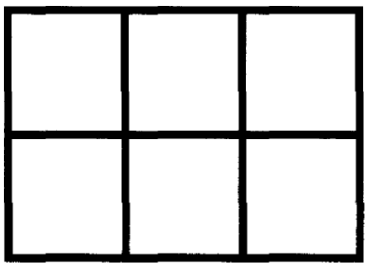
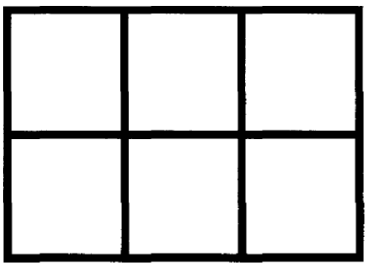
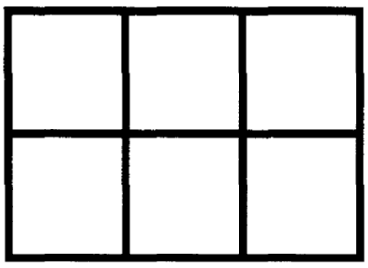
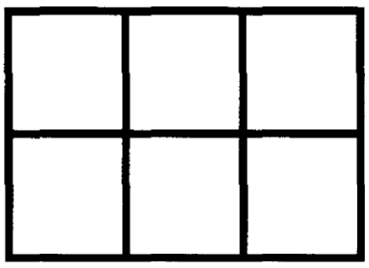
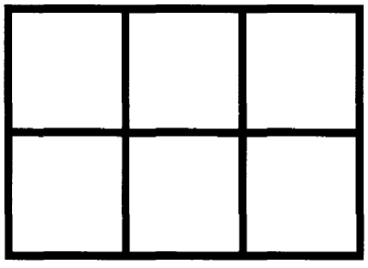
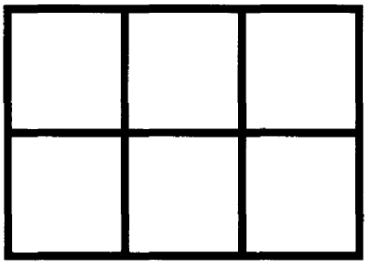
Extension:

3G + 5	1a) G = 3	14	b) G = 10	35			
	c) G = 7	26	d) G = 9	32			
J ÷ 2	2a) J = 10	5	b) J = 12	6			
	c) J = 24	12	d) J = 40	20			
M × M	3a) M = 5	25	b) M = 7	49	c) M = 9	81	d) M = 12	144
N^2	14a) N = 3	9	b) N = 2	4	c) N = 10	100	d) N = 5	25

Substitution Bingo!

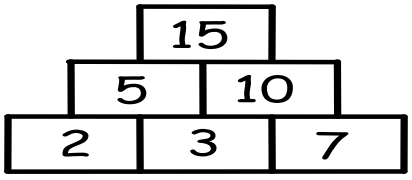
A = 1 B = 2 C = 3 D = 4 E = 5

Choose 6 numbers between 1 and 20 (including 1 & 20) and write them in one of the grids below. Your teacher will then call out each number using algebraic expressions and the code above. For example 2C = 2 x 3 = 6. The first one to cross off all 6 numbers wins!

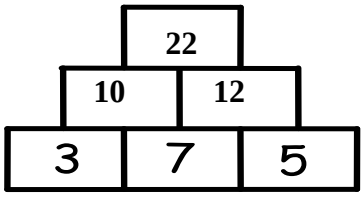









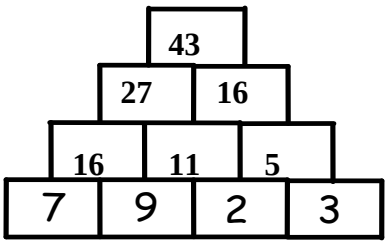
Lesson 4.1 : Algebra Towers

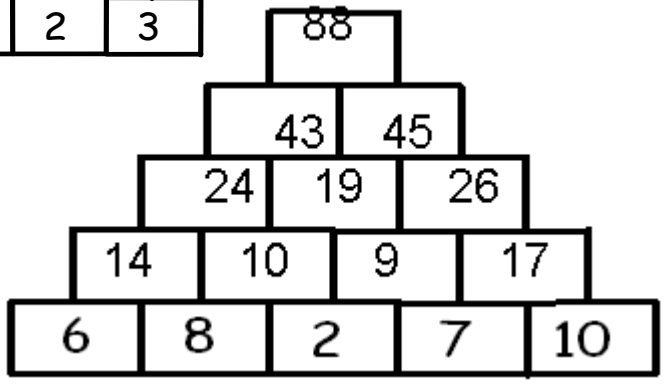
Another way to write expressions is by using an algebra tower. The two blocks below are added together to make the one above.



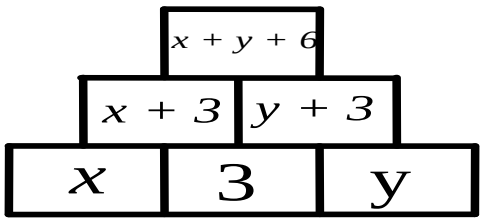
In the same way, complete the number towers below:



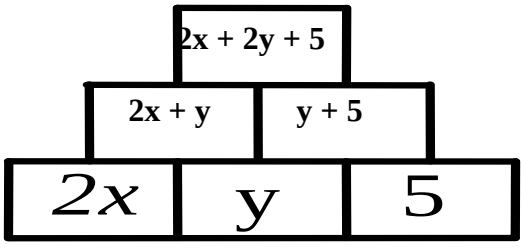




Now letters! Here is an algebraic tower filled in for you:



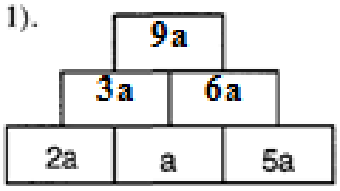
Now try and complete this tower:



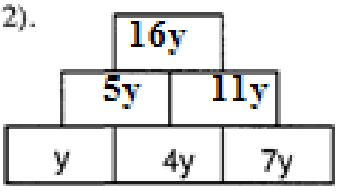
Try completing these algebra towers:

Introduction:

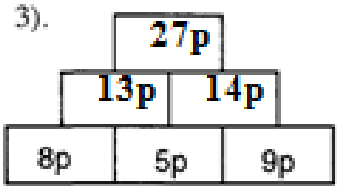
1).



2).

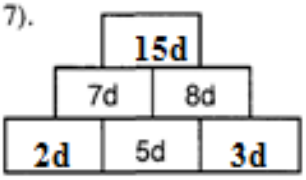


3).

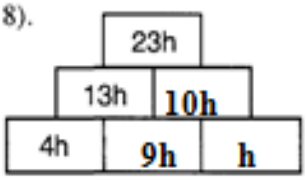


Consolidation: A bit trickier…

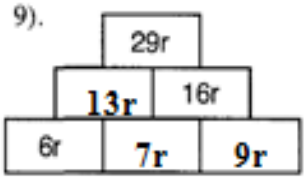
7).



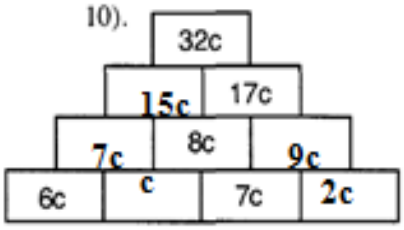
8).



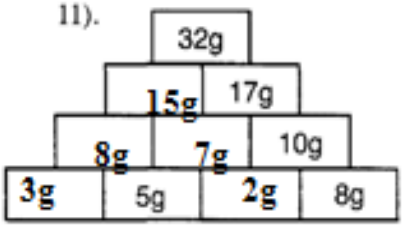
9).



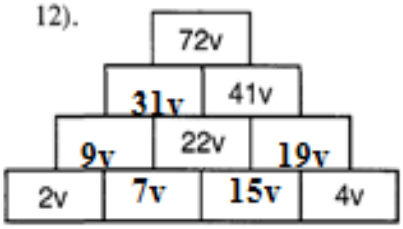
10).



11).

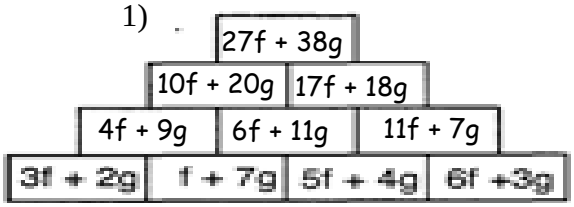


12).

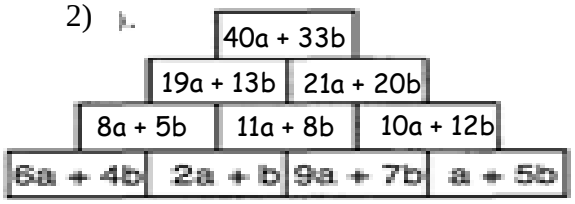


Extension: Can you complete these big towers?

1)



2)



Sequences

Part 1: Continue the sequence

Write down the next 3 terms in each of the following sequences.

Introduction:

1) 2, 4, 6, 8, ***10, 12, 14***

2) 1, 3, 5, 7, ***9, 11, 13***

3) 3, 6, 9, 12, ***15, 18, 21***

4) 4, 8, 12, 16, ***20, 24, 28***

5) 1, 4, 7, 10, ***13, 16, 19***

Consolidation:

6) 12, 23, 34, 45, ***56, 67, 78***

7) 100, 98, 96, 94, ***92, 90, 88***

8) 50, 44, 38, 32, ***26, 20, 14***

9) 63, 56, 49, 42, ***35, 28, 21***

10) 74, 63, 52, 41, ***30, 19, 8***

Part 2: Harder Sequences

These sequences do not go up by regular amounts. Find the next 3 terms in each one:

Introduction:

1) 2, 4, 8, 16, ***32, 64, 128***

2) 1, 3, 6, 10, ***15, 21, 28***

3) 1, 4, 9, 16, ***25, 36, 49***

4) 0, 5, 15, 30, ***50, 75, 105***

5) 3, 6, 12, 24, ***48, 96, 192***

6) 4, 8, 16, 32, ***64, 128, 256***

Consolidation:

7) 25, 24, 22, 19, ***15, 10, 4***

8) 1, 0.5, 0.25, 0.125, ***0.0625, 0.03125, 0.015625***

9) 1, 1, 2, 3, 5, 8, ***13, 21, 34***

10)1, 10, 11, 21, 32, 53, ***85, 138, 223***

Term to Term Rules

Part 1

Use the term-to-term rule and 1st term to generate the first 5 terms of the following sequences:

1) 1st term: 1	Rule: add 3	*1, 4, 7, 10, 13*
2) 1st term: 5	Rule: multiply by 2	*5, 10, 20, 40, 80*
3) 1st term: 12	Rule: subtract 4	*12, 8, 4, 0, -4*

Part 2

For each sequence below state the first term and the rule. The first one has been done for you.

Introduction:

1) 2, 4, 6, 8, ……	1st Term: *2*	Rule: *add 2*
2) 1, 3, 5, 7, ……	1st Term: *1*	Rule: *add 2*
3) 3, 6, 9, 12, ……	1st Term: *3*	Rule: *add 3*
4) 4, 8, 12, 16, ……	1st Term: *4*	Rule: *add 4*

Consolidation:

5) 1, 4, 7, 10, ……	1st Term: *1*	Rule: *add 3*
6) 12, 23, 34, 45, …….	1st Term: *12*	Rule: *add 11*
7) 100, 98, 96, 94, ……	1st Term: *100*	Rule: *subtract 2*
8) 50, 44, 38, 32, ……	1st Term: *50*	Rule: *subtract 6*

Extension:

9) 63, 56, 49, 42, ……	1st Term: *63*	Rule: *subtract 7*
10) 74, 63, 52, 41, ……	1st Term: *74*	Rule: *subtract 11*

Part 3

For each question below find at least two possible sequences by writing the next two terms and describe the rule used.

1) 1, 4, ……
   e.g. 1, 4, 7, 10 – adding 3
   e.g. 1, 4, 9, 16 – square numbers

2) 3, 7, ……
   e.g. 3, 7, 11, 15 – adding 4
   e.g. 3, 7, 10, 17 – Fibonacci

3) 5, 15, ……
   e.g. 5, 15, 45, 135, 405 – x by 3
   e.g. 5, 15, 20, 35 - Fibonacci

Part 4

For each question below find at least two possible sequences that could fit between each pair of numbers.

1) 1, ……, 8
   e.g. 1, 5, 8 – adding 3
   e.g. 1, 2, 4, 8 – doubling each time

2) 5, ……, 15
   e.g. 5, 10, 15 – adding 5
   e.g. 5, 7, 9, 11, 13, 15 – adding 2

3) 4, ……, 10
   e.g. 4, 6, 8, 10 – adding 2
   e.g. 4, 5, 7, 10 – adding the next consecutive number

Finding the nth Term from Patterns

For each of the patterns below:

a) Draw the next two patterns
b) Complete the table
c) Find the nth term
d) Find the 10^{th} and 100^{th} term

Introduction:

…… ……

Pattern Number	1	2	3	4	5
Number of match sticks	*4*	*6*	*8*	*10*	*12*

n^{th} term: *2n + 2* 10^{th} value: *22* 100^{th} value: *202*

…… ……

Pattern Number	1	2	3	4	5
Number of match sticks	*6*	*11*	*16*	*21*	*26*

n^{th} term: *5n + 1* 10^{th} value: *51* 100^{th} value: *501*

Consolidation:

……

Pattern Number	1	2	3	4	5
Number of match sticks	*8*	*14*	*20*	*26*	*32*

n^{th} term: *6n + 2* 10^{th} value: *62* 100^{th} value: *602*

.....

Pattern Number	1	2	3	4	5
Number of match sticks	*3*	*6*	*9*	*12*	*15*

n^{th} term: *3n* 10^{th} value: *30* 100^{th} value: *300*

Extension:

.....

Pattern Number	1	2	3	4	5
Number of match sticks	*6*	*10*	*14*	*18*	*22*

n^{th} term: *4n +2* 10^{th} value: *42* 100^{th} value: *402*

....

Pattern Number	1	2	3	4	5
Number of match sticks	*10*	*19*	*28*	*37*	*46*

n^{th} term: *9n + 1* 10^{th} value: *91* 100^{th} value: *901*

Extra puzzling puzzles

PROBLEM 1: Match Three

A	B	C	D	E	I	M	R
H	F	P	J	G	O	V	W
Q	K	T	U	S	Z	X	Y

PROBLEM 2: If … Then…

$7 - b = a$ $a + b + 3 = 10$ $7 - a = b$

$2(a + b) = 14$ $a + b - 5 = 2$

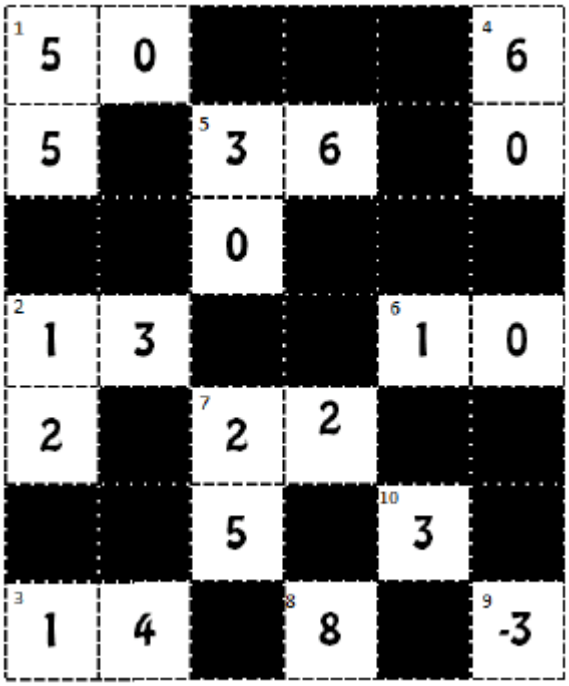
$a + 2b = 7+b$ $a = 7 - b$ $2a + 2b = 14$

$7 - 4b = a - 3b$ $b + a = 7$ $7 + a = 2a + b$

$a + b + b + a = 14$ $9 = a + b + 2$

$5a = 5(7 - b)$ $a - b = 7 - 2b$ $3a + 3b = 21$

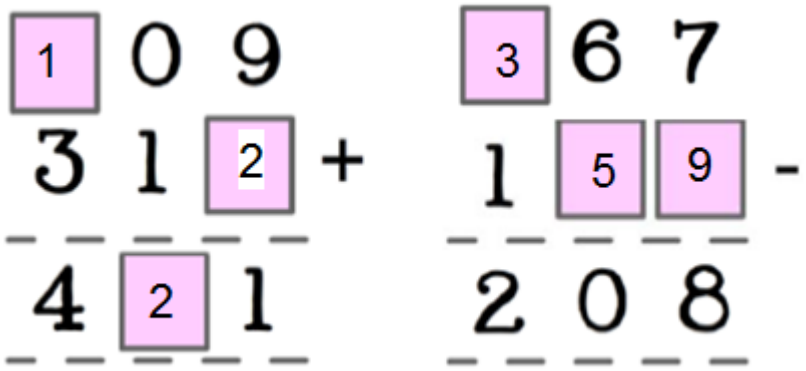
PROBLEM 3: Equations Cross Number



PROBLEM 4: Mystery Grid

7	5	6
1	2	0
3	8	12

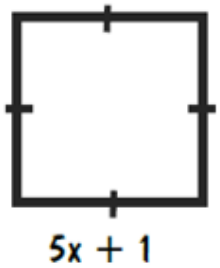
PROBLEM 5: Number gaps

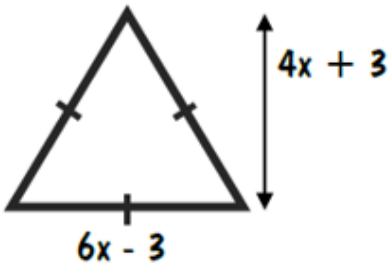


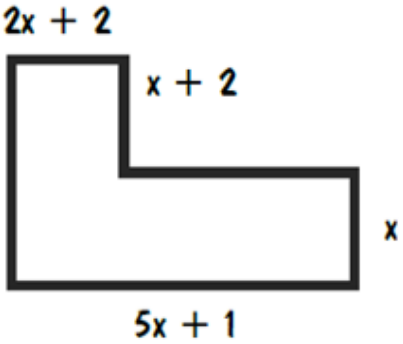
PROBLEM 6: Sequence match

sequence	10th term	nth term
1,4,7,10....	28	3n-2
2,8,14,20....	56	6n-4
18,14,10,6...	-18	22-4n
-4,-1,2,5...	23	-7+3n
0.1,0.4,0.7,1...	2.8	0.3n-0.2
9,11,13,15...	27	9 + 2(n-1)
-0.8,-1,-1.2,-1.4..	-2.6	-0.2n-0.6
5,15,20,25...	50	5n

PROBLEM 7: Shape Substitution







Area = 121

Perimeter = 44

Area = 44.5

Perimeter = 27

Area = 46

Perimeter = 34

PROBLEM 8: Forming Equations

I think of a number, double it and my answer is 15.	$2x = 15$	$x = 7.5$
I think of a number, double it and then add on 7. My answer is 8.	$2x + 7 = 8$	$x = 0.5$
I think of a number, halve it and my answer is 15.	$\frac{x}{2} = 15$	$x = 30$
I think of a number, double it and then add on 1. My answer is 15.	$2x + 1 = 15$	$x = 7$
I think of a number, halve it and then take away 2. My answer is 8.	$\frac{x}{2} - 2 = 8$	$x = 20$
I think of a number, add on 2, halve it and my answer is 8.	$\frac{x + 2}{2} = 8$	$x = 14$
I think of a number, add on 2 and my answer is 15.	$x + 2 = 15$	$x = 13$
I think of a number, double it and then subtract 1. My answer is 15.	$2x - 1 = 15$	$x = 8$

Chippenham

Partnership of Schools

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